

**OBSERVATIONS**  
ON THE  
PHRENOLOGICAL DEVELOPMENT  
OF  
**BURKE, HARE, &c.**



**OBSERVATIONS**  
ON THE  
**PHRENOLOGICAL DEVELOPMENT**  
OF  
**BURKE, HARE,**  
AND  
**OTHER ATROCIOUS MURDERERS ;**  
MEASUREMENTS OF THE  
**HEADS OF THE MOST NOTORIOUS THIEVES**  
CONFINED IN THE EDINBURGH JAIL AND BRIDEWELL,  
AND OF VARIOUS INDIVIDUALS,  
ENGLISH, SCOTCH, AND IRISH,  
PRESENTING AN EXTENSIVE SERIES OF FACTS SUBVERSIVE OF  
PHRENOLOGY.

READ BEFORE THE ROYAL MEDICAL SOCIETY OF EDINBURGH,

By **THOMAS STONE, Esq.**

PRESIDENT OF THE ROYAL MEDICAL SOCIETY.

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Testor utrumque caput.

VIRG. *Æneid*, iv.

“Assail our facts, and we are undone ; Phrenology admits of no exceptions.”  
*Phrenological Journal*, vol. iii. p. 258.

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THE circumstance of a regular course of lectures on Phrenology being yet publicly delivered in this city; and the acknowledgment that some individuals, not aware of the extent of the Phrenological delusion, yet hesitate to pronounce any opinion, either favourable or unfavourable to its pretensions, must alone plead my apology for directing the attention of a scientific Institution to an hypothesis which has been decidedly rejected by the most enlightened men in Europe, and which, from its earliest existence, has appealed rather to the credulity of the vulgar, than to the judgment of men of science. Astrologers, Metoposcopists, Physiognomists, and Chiromancers, have in every age arrogated to themselves a peculiar and superior insight into human nature; and, by pretending to predicate, by external signs, the faculties and dispositions

which influence the destiny of mankind, they have not failed to impose repeatedly on the understanding of the ignorant, and by appealing to accidental contingencies, which for a moment seem to favour their empirical speculations, they have occasionally taken by surprise the judgment of better educated individuals, who, after receiving the grossest fictions, in the belief that they are the soundest facts, become prepared to listen with a kind of religious gravity to the most ludicrous and incongruous assertions.

To trace the history of such conceits through the darker ages, in which they were first professed, is unnecessary ; I simply maintain, that the Phrenological indications by which it is at present pretended that the human character can be interpreted, are in every respect as unfounded, and can as little be relied on, as any of those old physiognomical superstitions, of which they originally formed a part, and to which they are still essentially allied. In confirmation of this assertion, I shall not enter into any psychological or physiological arguments, but proceed to communicate to the Society an induction of facts, on which alone I challenge the Phrenologists to peril the alleged veracity of their system.

The following are the enquiries which I have accordingly instituted.

I. *Does the Phrenological development of the murderer Burke correspond with his acknowledged character?*

II. *Does the Phrenological development of his*

*infamous accomplice Hare correspond with his acknowledged character?*

III. *Is it possible to distinguish the crania of murderers from other crania, by the Phrenological indications attributed to them?*

IV. *Do the most notorious thieves possess the organ of Acquisitiveness larger, or that of Conscientiousness smaller, than individuals of exemplary character?*

The attention of the public has for some time past dwelt with painful interest on the atrocities that have lately been perpetrated by Burke, and his miserable confederate Hare; and although the hand of humanity would willingly draw a veil over the recollection of their enormities, yet, as they have been guilty of iniquities almost unexampled in the annals of crime, there can be little doubt that they will long rank among the most notorious and execrable murderers that ever disgraced the history of human nature. The cruelties repeatedly committed by them were indeed of the most deplorable and appalling description. They were not prompted by the excitement of provocation, or suggested by any frenzied desire of vengeance;—they were not committed in moments of sudden or impetuous passion, but all, on the contrary, was cold-blooded, selfish calculation; and no savage in the remotest wilds of Africa ever heard more unmoved, or exulted more deliberately, over the repeated death-groans of their victims.—“After they ceased crying and making resistance,” says the Confession of Burke, “we

left them to die of themselves, but their bodies would often move afterwards, and for some time they would heave long breathings before life went away.”

As it is stated by Phrenologists, that deliberate and selfish murderers possess always a large endowment of the alleged organ of destructiveness, and as the atrocities of Burke and Hare are certainly of as great, or even greater magnitude, than any of those which were perpetrated by the criminals who supplied Gall and Spurzheim with the evidence by which they pretended not only to discover, but subsequently to establish this organ,—so in the cases of the West Port murderers, each should, on Phrenological principles, possess it exceedingly well developed.

### I.

*Does the Phrenological development of Burke correspond with his acknowledged character?*

On the morning after the execution of this criminal, his body was at an early hour conveyed to the anatomical rooms in the College, and our distinguished and popular Professor Dr Monro, gave the same morning a public demonstration of the brain. In the course of this dissection nothing remarkable was observed, excepting a certain degree of softness of the cerebral substance, which has been noticed by the learned Professor in the brains of other criminals also examined under similar circumstances, and which he is inclined to attribute to the lowness of the prison



diet some weeks previous to execution.\* It has been falsely and ignorantly stated to the public, that the lateral cerebral lobes were unusually developed, and the skull in that region rendered in consequence remarkably thin. Having made particular enquiries on this subject, I am enabled, on the best authority, to state positively, that no such remarkable development was observable. The attenuation of the bone alluded to refers to the squamous portion of the temporal bone, which is generally thinner than any other part of the cranium; and were the statement, therefore, even admitted to be correct, it would constitute no peculiarity in the skull of Burke. I may add, that I have examined many crania, in which, although the bones were much thinner generally, yet over the region of destructiveness they were much thinner and more diaphanous, than in this murderer, without the slightest external protuberance. The effect of any unusual fulness of the cerebral convolutions, seems indeed not to produce any elevation on the external table of the cranium, but simply to attenuate the internal, which is observable in the indentations of the *glandulæ Pacchioni*, which never produce any corresponding eminences on the external cranial surface.†

\* Monro's Morbid Anatomy of the Brain, p. 37, and 160.

† The relation which the external table of the skull bears to the internal is very ably and satisfactorily explained by Dr Milligan, in the *Appendix* to his valuable translation of Majendie's Physiology. "The *inner* or *vitreous table*," says he (page 566), "performs uniformly one office; it closely follows and embraces the figure of the brain; receiving the impression of every convolution, and penetrating

The organ of destructiveness in Burke has been called *large*. I proceed to enquire into the correct-

into every fissure with as much exactness, though not quite so deeply, as the membranes themselves. Meanwhile, the *external table* is no more a mere organ of defence than the muscles which cover it; it is an organ of *coaptation* or *articulation*, and accordingly is found to be impressed, elevated, and configurated, entirely, according to the necessities of this adaptation. Hence that line of it which corresponds to the transverse suture of the face is exactly adapted to the bones of the opposite margin of this suture, being thick where they are thick, thin where they are thin, serrated where they are serrated, and harmonic where they assume this appearance. It exhibits no relation to the internal table, till, being again turned inwards along the roof of the orbit, it re-approaches and coincides with it to form the thin edge, which, like another squamous portion, is to ride upon the alæ minores of the sphenoid bone. *The external table, then, of the frontal bone is in reality a bone of the face. Hence its development—or growth depends entirely on the growth of the bones of the face; for it has never been seen narrower or broader than the distance from the external orbital process of the one malar bone to the other, nor placed so close to the internal table and crista galli, that it was overlapped by the bones of the nose, or by the superior maxillary and malar bones. It follows, then, from what is said above, that the development of the internal table, and consequently of the frontal bone, follows the development of the brain; but the development of the external table of the frontal bone follows the development of the bones of the face. Now the brain, we have seen, arrives at its full size in the seventh year, which, therefore, is the period for completing the development of the internal table of the frontal bone; but the bones of the face continue growing to the twenty-first year, and hence anatomists find the dimensions of the frontal sinus go on increasing to that year; and the same authors generally find the sinus commence at the seventh year, because that is the time at which the nutritious arteries cease to do more than support its vitality.*

The learned author then continues (page 598) to explain very

ness of this report, and shall compare it, both in its absolute and relative size, with the same organ in two series of crania.

1st, With 50 crania, principally British, collected by Sir William Hamilton, with the measurements of which he has kindly favoured me.

2d, With the 50 crania collected by Dr Spurzheim, and at present in the Edinburgh Museum; of which 37 are male, 13 female. These also form a part of Sir William Hamilton's extensive induction, and being a closed collection, which may be appealed to at any time, I refer to them with confidence.

To ascertain the size of the cranium, I have had recourse to two methods:—

1st, I have taken its lineal dimensions, including its length, breadth, and height; the latter being obtained by measuring, with the callipers, from the anterior edge of the foramen magnum to the bregma.

2d, I have referred to the capacity of the cranium, or the weight of encephalon contained in each, which is ascertained by filling the skull with

clearly the formation of the *frontal sinuses*, and wherefore, in some cases, they are altogether wanting. His explanation of the relation of the external to the internal cranial table applies not to the bones of the skull only, but to all the flat and cylindrical bones of the body; and certainly Dr Milligan is entitled to much praise for having been the first to perceive, and satisfactorily expound, a law which appears to influence the whole osseous system.

sand, weighing the quantity each contains, and reducing the specific gravity of the sand to the specific gravity of the brain.

I give, first, the *absolute* size of the several organs ; secondly, their *relative* size, or the proportion which each bears to the contents of the skull, or to the weight of the encephalon. The latter, in consequence of crania being sometimes broken, it is not always possible to obtain, and in those examples the lineal dimensions are referred to. It is therefore of importance to notice, that I have found, from an induction of upwards of a hundred crania, that the proportions of the organs to the various sizes of crania, have borne a general relation to the proportions of the same organs to the same encephala. I give the result of my induction disjunctively, as well as concretely, to prevent the suspicion of any anomalous cases having affected the general average.

The size of Burke's cranium is 18 *inches*.

The weight of his encephalon 20507 *grains*.

From destructiveness to destructiveness measures 5.35 *inches*.

The proportion of destructiveness to the size of the skull is as 1 to 3.364.

The proportion to the encephalon as 1 to 3833.084.

On referring to Sir William Hamilton's General Table of adult male crania, I find, of fifty in which the measurement from destructiveness to destructiveness was taken, 8 are  $\frac{1}{2}$  *above* Burke, 29 are still *larger*, 13 only are *less*.

The *average* size of these crania estimated by the lineal dimensions of length, breadth, and height, is 18.2 *inches*.

The *average* size of the organ of destructiveness is 5.5 *inches*.

The proportion of destructiveness to the general size, on the general average of these crania, is as 1 to 3.309.

The results of the induction from these 50 crania are—

*First*, 37 of the 50 have the organ of destructiveness in its *absolute* size *larger* than Burke.

*Second*, The organ of destructiveness in Burke is in its *absolute* size *below* the average of these 50 crania.

*Third*, The *relative* size of the organ of destructiveness, or its proportion to the lineal dimensions of the cranium, is in Burke also *below* the average.

I proceed next to the second series of crania to which I have adverted, the collection of Dr Spurzheim in the Edinburgh Museum, the measurements of which are given in a table presenting a view of the absolute sizes of the several organs, and their individual proportions to the encephalon.\*

The average *absolute* size of the organ of destructiveness in these 37 male crania is 5.6 *inches*.

The average *relative* size of the organ of destruc-

\* See Table I. Measurements of adult male crania.

tiveness, or its average proportion to the encephalon, is as 1 to 3634.261.

Of these 37 crania, taking them disjunctively, 34 have the organ of destructiveness in its *absolute* size *larger* than Burke—27 have it *larger* in proportion to the encephalon.

The result is that, when compared with these 37 crania, the organ of destructiveness in Burke is both absolutely and relatively *below* the average size.

Having established this fact by the most direct and conclusive evidence that can possibly be obtained, it cannot fail to illustrate, in a very striking manner, the fallacy of this phrenological indication.

This murderer, it should be remembered, was not instigated to the commission of crime by the want of those common necessities of life which have sometimes urged the victim of poverty to become the victim of guilty desperation. He was, although a stranger, and poor, when he arrived in Edinburgh, a man who had borne a respectable character, and might have procured some honest employment; but it appears that, one evening, when sitting by the fireside with Hare, they overheard a woman lodger breathing heavily in her sleep, on which Hare remarked, "Do you hear that? it would not be difficult to take her where we took Donald," a poor pensioner who had some days before expired in the same room, and whose remains they had subsequently sold. The diabolical suggestion was no sooner given utterance to, than Burke readily acquiesced, observing that they might have recourse to the method

adopted by Hazael, when he destroyed Benhadad the King of Syria, by dipping a cloth in water, and covering his mouth. The hint was immediately put in practice,\* and from that night a deliberate system of murder was carried on, the aggravated horrors of which transcend all possible description, and do more than realize the most tragical scenes that “fiction ever feigned, or fear conceived.” Nor does the disposition of Burke seem to have been influenced by any remarkable desire of gain, or acquisitiveness. He allowed Hare and his wife, it appears, to share the greater part of the blood-money they obtained; and Hare himself acknowledged that Burke was always very ready to give away his money, and free with it among those of his companions who were poorer than himself. On one occasion, a Student having purchased and paid him for the extremity of a subject, Burke received the price of the body to the full amount, on which he immediately sought the Student, and, of his own accord, refunded him the money.

Neither were the murders of which he was guilty committed only in moments of excitement from intoxication; it appears by the evidence that he never lost his self-possession from the effects of drinking, and the address with which he contrived so frequently to impose on his unfortunate victims, proves him to have been the very man who could “smile, and murder while he smiled;” and who took a deliberate

\* This anecdote is given in the Evening Courant, February 7, 1829.

and fiendish pleasure in multiplying the number of his atrocities. Throughout his guilty career, he manifested, to a singular extent, all the attributes which are by Phrenologists referred to the supposed organ of Destructiveness, which, so far from possessing any characteristic development, is the very reverse of the condition it should have exhibited, in order to accord with one of the most fundamental propositions of the Phrenological theory.

The organ of Benevolence next claims consideration; and surely never did any individual more completely divest himself of all the commonest sympathies of humanity than Burke? He had indeed so familiarized his mind to scenes of murder, and his heart, hardened with excess of crime, had become so callous, that he not only viewed with disregard the anguish of the sufferers who were immolated on the infernal altar of his iniquity, but seems coolly, in the midst of his atrocities, to have reconciled himself to the ignominious fate which he knew awaited him. So frequently had he grappled with the dying—so often had he hurried his victims into the arms of Death,—that he seems for a time to have viewed with indifference the terrors of his countenance. The day before his execution, he stated that, in his soberest moments, he frequently used to reflect that he should one day be hanged, and often accustomed himself to consider how, when the time arrived, he should conduct himself on the scaffold. His savage disposition frequently manifested itself, and more than once he beat the woman with whom he cohabited, in so barbarous a manner, that



medical assistance was obliged to be procured for her. The organ of Benevolence on the skull of Burke, measures from the meatus 5.1.\* Its proportion to the encephalon is as 1 to 4020.980. On referring to the table of adult male crania, the average size of Benevolence in the 37 crania, is 5.011. Its average proportion to the encephalon is as 1 to 4089.288.

Taking them disjunctively, 9 of these have the organ of Benevolence in its *absolute* size the *same* as Burke; 20 in its *absolute* size *less* than Burke; 22 have it less in its *relative* size, or in its proportions to the encephalon.

The organ of Benevolence in Burke is, it will be seen, both *absolutely* and *relatively* above the *average* size of the same organ in these 37 crania.

On this fact it is unnecessary to comment; I am indeed aware it has been stated by some of the most distinguished of the Edinburgh Phrenologists, that, in accordance with the large development of the organ, Burke was really a benevolent man; but I apprehend the public generally will maintain a very different opinion, and to argue the point seriously would be to indulge in one of the severest satires that can be conceived, on the incongruity of the phrenological doctrines.

\* This measurement was taken after the horizontal section of the skull had been made, and as in the sawing some portion of bone must have been lost, the organ measured even more than I have estimated it; for, giving the Phrenologists every advantage, I have made no allowance for this, although it is clear that at least 1-10th may on this account fairly be added.

I next proceed to the organ of Conscientiousness.

This organ in Burke measures from the meatus 4.6. Its proportion to the encephalon is as 1 to 4458.043.

On referring to the table of adult male crania, it will be seen that the average *absolute* size of the organ of Conscientiousness is 4.462. The average *relative* size is as 1 to 4585.414.

Taking the crania disjunctively, 9 possess the organ of Conscientiousness in its *absolute* size; 21 in its relative size *less* than Burke.

The result is, that Burke possesses the organ of Conscientiousness both absolutely and relatively *above* the average size.

The organ of Amativeness next deserves particular attention, as Burke manifested the propensity attributed to it in an excessive degree. He married at an early age, and on the pretext of a quarrel with one of his wife's relatives, left her, and absconded with another woman; and even when living with her, maintained another profligate in the Canongate, at his own expense, with whom he as systematically cohabited. The Phrenologists have themselves averred, that the large development and abuse of this organ, was in a great measure the cause of his entering on so fatal a career of crime. They have therefore announced that it was large;—this I deny. ))

In the paper I had the honour of reading to this Society in 1825, I observed that the phrenological casts of murderers, for the following reason, never can be relied on: When the criminal, having been executed, is cut down, the body is thrown generally

upon its back, and the blood, which, in cases of death by lightning, drowning, hanging, &c. remains uncoagulated, gravitates to the most depending parts of the person, a considerable distension of the muscles of the back, neck, and posterior parts of the head, is thus produced; and over this distension the cast is usually taken. The organs of the alleged animal propensities are in consequence made to appear very large, whilst those to which the intellectual faculties and moral sentiments are ascribed, for the same reason, and from the contrast, present as remarkable an appearance of deficiency. Such was the condition of the head of Burke at the time when Mr Joseph took the cast of it, which, in this, as in other instances, forms a part of the erroneous data on which Phrenologists accustom themselves to reason.\* The organ of Amativeness may *then* have appeared *large*; but this only affords an additional illustration of the impossibility of forming, from external inspection under such circumstances, any correct idea of the size of the cerebellum.

Here I must acknowledge myself indebted to Sir

\* It is acknowledged that the organ of Destructiveness, owing to the "swelling of the integuments," measures on the cast of Burke 2-8ths more than it did on the head during life. Why has not an acknowledgment of a similar kind been made in reference to the busts of Haggart, Pallet, Thurtell, Mackinnon, &c.? Are the Phrenologists not aware that such must have been the case in *every* criminal whose cast has been taken under similar circumstances? How is it possible to judge of the *relative* development of any of the supposed organs, when the posterior and postero-lateral parts of the head are in this state of congestion?

William Hamilton, who has favoured me with a comparison of the weight of Burke's cerebellum, with the cerebella of various classes of subjects. We need not, in the present instance, therefore, trust to the report of any external manipulation, as we thus have it in our power to set all conjecture at rest, by appealing to the most satisfactory and conclusive evidence. From this comparison it appears;—

1st, The cerebellum of Burke is *less* than the average of *all* the adult *males*. (Twenty in number.)

2d, It is *less* than the average of *all* the *impuberal males*, from *three* years of age to *fifteen*. (Seven in number.)

3d, It is *less* than the average of *all* the *adult women* under *sixty*. (Fifteen in number.)

4th, It is *less* than the average of *all* the *impuberal males* above *four*. (Two in number.)

On comparing the size of Burke's cerebellic cavities with those of the different classes of subjects in Sir William Hamilton's table of open crania, they are;—

1st, *Less* than the average of the *male adult* crania. (Thirty-three in number.)

2d, *Less* than the average of the *female adult* crania. (Thirty-two in number.)

3d, *Less* than the average of the *female impuberal* crania, from four to twelve. (Six in number.)

They are a little larger, however, than the *male impuberal* crania.

The morning I took the size of the cerebellic cavity in Burke; two subjects, one a woman of *thirty-eight*, the other a female child of *eight* years of age, happened to be lying on the table, with the crania open. I proceeded, therefore, to compare the size of their cerebellic cavities with Burke's. Sir William Hamilton was present, who, from his extensive experience and knowledge on this interesting point of controversy, predicted that the child and woman would be found to possess each a larger cerebellum than Burke. I confess I was somewhat sceptical as to the result of the experiment, but found, on measuring the dimensions, as follows:—

	Circumference.	Length.	Breadth.	Total Size.
Burke, . . .	7	2.8	1.8	11.6
Woman, . . .	7.1	2.8	2	11.9
Female child,	7.2	2.8	2.1	12.1

Hence both the woman and child proved to have the cerebellic cavities larger than they are found in the murderer Burke, and this will not fail to make the erroneous Phrenological assumption appear still more ridiculous, when it is considered, that so much of the moral degradation of this atrocious villain was referred to the size and abuse of an organ, which even an impuberal child of eight years of age possessed larger.

In addition to the number of facts which have been accumulated by Sir William Hamilton, and which constitute the extensive induction he lately communicated to the Royal Society, I cannot help re-

garding these also as strongly illustrative of his position, that while the cerebellum bears its largest proportion to the cerebrum at three years of age, the whole encephalon attains its full complement before the age of puberty, and is absolutely and relatively larger in the female than the male. It is certainly singular that physiologists have so little investigated this interesting subject of enquiry, and the scientific world will not fail to acknowledge itself indebted to the researches of Sir William Hamilton.

The public is aware that Burke suffered under a complaint which was of a scrofulous character; and the following is a report of the pathological appearances which on dissection were presented. The account was originally drawn out by Mr Miller, the assistant of Dr Monro, and being purely of a professional nature, I have thought proper to present it in Latin.

“ Nefandi hujus homicidæ cadaver explorantibus, unus tantum testiculus, quod notatu dignum est, apparuit; alter enim morbo, quo laboraverat, absorptus prorsus fuerat. Morbus iste testiculi exulceratio scrophulosa fuisse videtur, et ea infra posui, quæ post mortem detecta fuerunt. Scroti exterioris aspectus a sinistrâ quidem raphes parte naturalis erat; a dextrâ vero ulcera complurima, sinuosa, ut ita dicam, inertia videbantur. Hæc scroti partem maxime occupabant eam, quæ, corpore erecto, femori interiori apposita est, eamque etiam ubi scrotum et femur inter se continua fiunt. Alicui minus curiose inspicienti hæc summæ cuti tantum adjacere, neque alte ad

testiculum ipsum penetrare viderentur. His tamen patefactis, externis involucris sublatis, aliquantum humoris reperiatur coloris subflavi sive subfusci, ei similis qui sinibus foras effluebat. Ultra secantibus, a dextrâ, ne minimum quidem vestigium Tunicae vaginalis, *nihil testiculi*, apparuit; quorum quidem locum complebat materia quaedam semi-fluida, pulla, nullo modo peculiari olens, meconium quodammodo referens, vix tamen pariter nigricans. Vesiculæ seminâles solito ampliores erant, humoremque subfuscum intus habebant. Pluribus in locis scroti septum exesum erat et paucillum ideo materiæ istius subatræ in sinistro quoque latere, ad partem tunicae vaginalis superiorem, et extra eam, repertum est. Eâdem materiâ etiam refertæ erant membranæ, quæ acceleratores urinæ obtegunt, adiposa et cellulosa. A sinistro latere, tunica vaginalis et testiculus naturali, quod ad fabricam, aspectu gaudebant; *hic autem testiculus certe minor erat solito*, longe aliter ac plerumque fit, ubi alter perierit testiculus. Chorda spermatica utrinque solitam superare magnitudinem inveniebatur.”

As Burke had been labouring under this complaint for many years, according to the statement of Gall and Spurzheim, we ought to have found a diminution of the opposite lobe of the cerebellum; but no such difference was observed.

In the case of Bobby Auld, a celebrated idiot boy, who was well known in Edinburgh,—“cui mortem intulit ictus a calce asini in inguine acceptus, repertum est, *neutrum testiculum in scrotum descendisse*. Dexter sectione reclusus, parvulus, capiti cæco coli

adhærebat ; *sinistri ne vestigium quidem reperiri poterat.* Chorda spermatica et vesicula seminalis utriusque lateris naturales erant ; hinc, et ex natura et historia morbi verisimile videtur testiculum sinistrum prius extitisse, et postea massa morbida et spongiosa fuisse implicatum.”\*

In this instance, although the cerebellum was stated to be small, yet in proportion to the cerebrum it bears its appropriate size. The cerebellic cavity measures in circumference 7.6 inches ; in length 2.5 ; in breadth 1.9 ;—Total 12, which is also larger than Burke’s.

I have now selected two of the most prominent features in the character of Burke :—*First*, His Destructiveness as a cold-blooded, systematic murderer. *Second*, His Amativeness, which is admitted to have been excessive ; and, directing the attention of the Phrenologists exclusively to these manifestations, have proved them to be directly at variance with his Phrenological development. It is unnecessary to enter into minor details. My counter Phrenological propositions are ;—

*First*, The organ of Destructiveness in Burke is absolutely and relatively *below* the average size, whilst Benevolence and Conscientiousness are absolutely and relatively *above* the average size.

*Second*, The cerebellum in Burke was also *below* the average size.

\* See Dr Ballingall’s Clinical Lecture for 1827.



## II.

*Does the Phrenological development of Hare correspond with his acknowledged Character?*

The evening before this miscreant was liberated from prison, with the assistance of an able Phrenologist, and in the presence of several individuals, some of whom were favourable, others adverse, to the Phrenological theory, I took the measurement of his head, of which the following is the report :—

Size of the head, . . . . .	13.8 inches.
From the ear to Lower Individuality, . . . . .	4.8
From ditto to Philoprogenitiveness, . . . . .	5
From ditto to Benevolence, . . . . .	5.4
From ditto to Conscientiousness, . . . . .	4.6
From Destructiveness to Destructiveness . . . . .	5.95
From Acquisitiveness to Acquisitiveness, . . . . .	5.55

The proportion of Destructiveness to the size of the head, is as 1 to 2.319.

The proportion of Benevolence to ditto, is as 1 to 2.555.

The proportion of Conscientiousness to ditto, is as 1 to 3.

After consulting a number of scientific authorities, and making a variety of experiments to determine which is the best method of ascertaining the size of the head, I have not found a better suggested than

that which is adopted by hatters, who add together the length and the breadth for the purpose of taking the mean diameter. To gauge its depth, or ascertain in any way the precise capacity of the living head, I find to be impracticable; and having, as I have already stated, found on a large induction, that the proportions of the several organs to the lineal dimensions of crania, bear a general relation to the proportions of the same organs to the same encephala, I have adopted the method, to which hatters have recourse, for the purpose of giving the proportions of the organs to the diameter of the head.

On comparing Hare's organ of Destructiveness with my table of Englishmen, (twenty-eight in number,) I find

11 have it in its *absolute* size *larger*; 6 in *absolute* size the *same* as Hare.

20 have it in proportion to the size of the head *larger*.

The average *absolute* size of the organ of Destructiveness in the twenty-eight Englishmen, is 5.953.

Its average proportion to the size of the head in the same, is as 1 to 2.282.

The result is, the organ of Destructiveness in Hare, is, in its *absolute* size, *not above* the average; in its *relative* size, or in proportion to the dimensions of the head, it is *below* the average.

On examining my table of Scotchmen, (twenty-five in number,) I find

13 possess the organ of Destructiveness in its absolute size *larger* than Hare.

6 the *same*.

20 possess it *larger* in proportion to the size of the head.

The average absolute size of the organ of Destructiveness in the 25 Scotchmen, is 5.97.

The average proportion to the size of the head, is as 1 to 2.276.

The result is, that compared with my table of Scotchmen, the organ of Destructiveness in Hare is nearly the same in its absolute size as the average, the former measuring 5.95, the latter 5.97 *inches*; but in proportion to the size of the head, Hare's organ of Destructiveness is *below* the average.

On referring to my table of Irishmen, (twenty-seven in number,) I perceive

12 possess the organ of Destructiveness in its absolute size *larger* than Hare.

16 possess it larger in proportion to the size of the head.

The average *absolute* size of this organ in the 27 Irishmen is 5.907.

Its average proportion to the size of the head in same is as 1 to 2.308.

The result is, that compared with my table of Irishmen, the organ of Destructiveness in Hare is, in its *absolute* size, nearly the same as the average, the former being 5.907, the latter 5.95 *inches*; but in proportion to the size of the head, Hare's organ of Destructiveness is *below* the average.

From the general lowness of the head of Hare, the organs of Benevolence and Conscientiousness are both a little below the *average* size ; but so far from this constituting any peculiarity in his case, or being indicative of the character he manifested, several individuals in my Tables will be found to possess these pretended organs of the moral sentiments even still more deficient.

In my table of Englishmen,

3 have the organ of Benevolence in *absolute* size the *same* as Hare.

8 have it in *absolute* size *less* than Hare.

5 have it *less* in proportion to the size of the head.

In my table of Scotchmen,

2 have the organ of Benevolence in its *absolute* size the *same* as Hare.

4 have it in its *absolute* size *less*.

4, in proportion to the size of the head, have it *less*.

In my table of Irishmen,

7 have the organ of Benevolence in its *absolute* size the *same* as Hare.

6 have it in its *absolute* size *less*.

5 have it *less* in proportion to the size of the head.

Of the organ of Conscientiousness, it will be seen, in the Table of Englishmen, that

4 have it in its *absolute* size the *same* as Hare,

5 have it in its *absolute* size *less*.

In the table of Scotchmen,

6 have it in its *absolute* size the *same* ;

4 have it in its *absolute* size *less* than Hare.

In the table of Irishmen,

8 have the organ of Conscientiousness in its *absolute* size the *same* as Hare ; 2 *less*.

Hence, notwithstanding that the head of this murderer is characterised by a deficiency in the development of the alleged organs of Benevolence and Conscientiousness, many individuals of exemplary character are found to possess the same organs still more deficient ; and consequently, this configuration is by no means indicative of that moral degradation which the murderer exhibited. It should also be remembered that the persons whose measurements I have presented in my Tables, were taken *without any selection* ; for had I, in imitation of the Phrenologists themselves, proceeded on the principle of excluding from my induction all negative testimony, and given merely those examples which favoured my own views, I could have collected many more with the Destructiveness larger than Hare, and the presumed organs of Benevolence and Conscientiousness absolutely and relatively smaller. But by merely having recourse to indiscriminate measurements, several such have occurred, and consequently we are entitled to conclude that such a configuration cannot be relied on as an indication of moral depravity, but is a common condition of the head, which may co-exist with every variety of disposition.

The most remarkable, and best developed Phreno-

logical organ in the head of Hare, is his *Ideality*. At the time we took the measurement, one of the most highly-gifted and popular of our living poets was present, whose genius is peculiarly characterised by the vividness and power of its *idealism*. On applying the callipers to the organ of ideality in Hare, each leg of the callipers resting on the origin of the temporal muscle, and transferring them to corresponding points on the head of the poet, we found that Hare possessed a larger organ of ideality than the poet. When applied to the former, the callipers rested on the origin of the muscle; when we attempted to apply them to the latter, they came down far over the belly of the muscle. The experiment was several times repeated, and *from whatever point* of the organ the measurement was taken, the result proved to be the same. Hare's organ of ideality, also, is larger than the same organ in Sheridan, Sterne, Canning, Voltaire, and Edmund Burke, the distinguished and eloquent author of the Letters on the French Revolution.

Notwithstanding his superior development of the organ of ideality, it would be difficult to conceive a more stupid and miserable wretch than Hare.

When we visited him, he was not inclined to answer any questions, until repeatedly assured by the Governor that we were not sent by the Sheriff to make any investigation into the particulars of his case. To the enquiry, why, in Court, he had said it was indifferent which way he was sworn, and to the observation that we had understood he was a Roman

Catholic, he retorted, with a contemptuous sneer, he “did not rightly mind what he was.” To the question, whether his conscience ever troubled him, he answered, with a laugh, “No, with the help of God.” His whole demeanour was that of a man evidently devoid of every moral reflection, and he seemed, with his head adorned, as if in mockery of Phrenology, with large organs of Ideality, Causality, and Wit, to be only a few degrees removed from the very lowest of the brute creation.

The counter Phrenological propositions deduced from the case of Hare, are—

*First*, The organ of Destructiveness is in this atrocious murderer *not above* the average size.

*Second*, Many individuals of exemplary character, at the same time that they possess the organ of Destructiveness larger than Hare, exhibit a greater deficiency in the alleged organs of Benevolence and Conscientiousness.

I have not, it may be added, referred to the supposed organ of Amativeness, being satisfied that it is impossible to ascertain its size by any external manipulation. The uncertain and varying thickness of the muscles at the back of the head and neck, must alone oppose a very considerable impediment to any such pretension; in addition to which, it has been observed by Sir William Hamilton, that the superior external spine, which is supposed to correspond with the internal crucial spine of the occipital bone, and consequently to afford an indication of the height to

which the cerebellum ascends, frequently bears no such correlation. In a number of crania, he has observed that the internal crucial spine sometimes descends as much as an inch *below*, sometimes ascends as much as an inch, or more, *above* the line of the external occipital; and the latter, therefore, is no criterion by which the manipulator can judge of the size of the cerebellum.

### III.

*Is it possible to distinguish the crania of murderers from other crania by the Phrenological indications attributed to them?*

I need scarcely observe, that the following are the indications which Phrenologists attribute to the crania of murderers:—

- 1st, A large endowment of the organ of Destructiveness.
- 2d, A deficiency in the development of the alleged organs of the Moral Sentiments.
- 3d, A deficiency in the anterior cerebral development, or the quantity of brain before the ear; whilst the posterior cerebral development, or quantity of brain behind the ear, is supposed to bear the greater proportion to the size of the head.

Before communicating to the Society the result of my investigations on these subjects, I shall briefly refer to the crimes for which the several murderers



were executed, whose cranial measurements are included in this part of my induction.

### I. *Burke.*

The atrocities of this murderer have already been considered, and the propositions deduced from the measurements of his cranium fully stated.

### II. *Haggart.*

The particulars of the crime for which this murderer was executed must still be in the recollection of the public. He was an expert thief, and was hanged for murdering the turnkey of the prison in which he was confined.

### III. *Scott.*

This murderer was tried before the Court of Justiciary, at Jedburgh. By the evidence adduced on the trial, it appeared that, having quarrelled at Earlstoun fair with two men, his former companions, he overtook them on their road homewards, and barbarously murdered them ; after which, he took a knife from his pocket, and mangled their bodies in a most savage manner. “ He was unanimously found guilty, and sentenced to be executed as near the spot where he committed the murders as should be found convenient. During the whole trial, he behaved himself with great self-possession, and continued perfectly calm and composed after the fatal verdict was returned.”\*

\* A particular account of the execution, dying declaration, and behaviour, of Robert Scott, who was executed on that part of the

V. *Anderson*.—VI. *Glen*.

These two men were executed in Ayrshire, for assaulting several people on their way home from church, and murdering two of them in a most brutal manner.

VII. *Balfour*.

This culprit was executed at Dundee, for murdering his wife, in a fit of jealousy.

VIII. *Gordon*.

This murderer was found guilty of killing John Elliot, a poor pedlar boy, rather weak in his intellect, at a solitary place on the farm of Upper Cassock, in the parish of Eskdalemuir, after which he robbed him of his pack. From the evidence, it appeared “ that Gordon fastened himself on the unfortunate youth for three days, although they had no previous acquaintance, was seen entering with him into the wilds of Eskdalemuir, about three o’clock in the afternoon, and, on the evening of the same day, was seen emerging from these wilds *alone*, in possession of, and selling articles from, the pack, which was identified as having belonged to the murdered boy. It was further proved, that the instrument made use of in committing the murder was a clog which was worn by Gordon. The criminal behaved, during the address of the Lord Chief Justice, in a very unbe-

road between Earlstoun and Greenlaw, for the barbarous murder of two men, on the 30th of June last. James Docherty, writer.

coming manner, and, when the judge earnestly called on him to prepare for eternity, and to throw himself on the mercy of the Redeemer, he muttered between his teeth, ‘ I renounce it—I renounce it.’ ”\*

### IX. *Cockburn.*

This murderer was executed for stabbing a man with a knife, in a fit of passion. The crime was committed at Falkirk ; and it is unnecessary to detail the particulars.

### X. *Lingard.*

This criminal was tried at the assizes in Derbyshire for the murder of a woman who resided by herself at the toll-bar at Wardlaw Myres, in the parish of Tideswell, in that county. The murderer was discovered, by circumstantial evidence, in a singular manner. He had, it appears, after committing the murder, taken all the money he could collect in the toll-house, and with it a pair of shoes that had belonged to the deceased. When the report of the murder disturbed the neighbourhood, the fact of his possessing the shoes excited suspicion, and ultimately led to his apprehension. He at first strenuously denied all participation in the crime, but subsequently confessed himself to have been guilty. His confession states, that having frequently cohabited with the murdered woman, she on one occasion declared that she would “swear her life against him,” on which he

\* Constable’s Scots Magazine, 1821, p. 582.

“took the determination to kill her, and immediately seized her by the neck, and held her for about ten minutes until she lay still, and he thought she was dead. He then left loose of her ; but, to prevent the possibility of her recovering, tied a pocket handkerchief, which she had round her head when he went in, but which had come off in the struggle, tight round her neck.”\* This murder, it will be observed, was committed in a fit of passion, and in self-defence.

### XI. *Pepe.*

This murderer was a Spaniard, and one of the atrocious leaders of a band of pirates, in the West Indies. A brief account of the atrocities of Pepe may be gathered from a report in the Phrenological Journal.† He was one of the four pirates who murdered the crew on board the Crawford, a vessel which, loaded with a cargo of American produce, sailed from Providence, Rhode Island, and was bound for Mantaza, in the Island of Cuba. The pirates, it is stated, first endeavoured to poison the crew, but failing in this attempt, resolved to have recourse to more desperate means. They armed themselves accordingly for the bloody tragedy ; and, in the dead of night, having alarmed the crew by screaming frightfully in various parts of the vessel, every individual, as he came on deck, either from the fore-castle or cabin, was stabbed. The skull of Pepe was brought over to this

\* Confession of Anthony Lingard, dictated in the presence of one of his Majesty's Justices of Peace in the county of Derbyshire.

† Vol. v. p. 365.

country by Captain Graham, and presented to the Edinburgh Anatomical Museum by his brother, the distinguished Professor of Botany in this University.

## XII. *Macmillan.*

This man was executed in Ayr, for the murder of a woman, to whom, during the time of pregnancy, he administered some drug for the purpose of producing abortion. As he probably was guilty of this crime without any intention of killing her, it is unnecessary to enter into the details of the evidence adduced on the trial.

## XIII. *Mortimur Collins.*

This murderer was executed in Glasgow, for stabbing the keeper of Bridewell. He was a determined villain, and states in his confession, that, notwithstanding he had been indicted before the Sheriff Court, and committed to prison, for beating an old man in a most barbarous manner, on his liberation he again resumed his abandoned course of life.\* He was unanimously found guilty.

## XIV. *Clydesdale.*

This murderer, who had been a collier at Laigh Drumgulloch, in the parish of New Kirkland, was

\* The last Speech, Confession, and Dying Declaration of Mortimur Collins, soldier in the 37th Regiment of foot, who was executed at Glasgow on Wednesday, the 7th day of November, 1792, and his body given to the Doctors, for the murder of John Panton, keeper of Bridewell.—Printed by Galbraith.

convicted of “ wickedly and maliciously assaulting Alexander Love, an old man, and inflicting on his head, and other parts of his body, many severe blows with a coal pick, in consequence of which he died soon after.” Throughout the trial, it is stated that he conducted himself with the most brutal indifference, and heard the verdict from the Jury, and the pathetic address of the Judge, without the slightest emotion. During the course of the trial it came out, on the cross-examination of one of the witnesses, that when Clydesdale returned home after committing the fatal act, he seized a cat that was in the room, dashed it against the floor, and put it on the fire. The relation of this piece of cruelty excited a sensation of horror through the Court.\*

#### XV. *M'Kean.*

This murderer was executed in Glasgow. He was a notorious and atrocious villain, who, from the earliest period of his life, was addicted to every species of vice. He finally consummated his career of crime by murdering a man named Buchanan, the Lanark carrier. When under sentence of death, he wrote, like Haggart, a narrative of his past life, which contains, like all documents of a similar kind, much hypocritical and whining cant. Rochefoucault, in his *Maxims*, remarks, that “ Criminals sometimes, at their execution, affect a constancy and contempt of death, which is in fact nothing more than the fear

\* Constable's Scots Magazine, October 1818, p. 378.

of facing it. Their constancy and contempt may be said to be to the mind, what the cap is to the eyes." There may be much truth in this observation; but it more frequently happens, that the most unprincipled and abandoned villains, finding their career of guilt drawing to a close, and a certain and ignominious death awaiting them, suddenly assume an air of piety and devotional cant, which are mere ebullitions of temporary fear, and little indicative of their real dispositions; for were their dungeon doors thrown open, and their liberty restored to them, there is every probability, as experience has repeatedly proved, that they would again engage in the same crimes with which they have been familiar from youth. The characters of such miscreants are not to be judged of by their dying speeches, confessions, and declarations, but by the conduct they have exhibited during the general tenor of their lives; and it is well known, that M'Kean was a treacherous, cruel, and abandoned culprit.

#### XVI. *Buchanan.*

This murderer was executed in Glasgow. On his trial it appeared, that the woman he murdered had excited his ill-will, by giving evidence against a girl who had stolen a shawl, and who was a favourite of his. He accordingly called at a house which he knew she frequented, and having enticed her into a closet with him alone, beat her in a brutal manner, and kicked her violently several times in the abdomen, in consequence of which she died a short time afterwards, in excruciating agony. The Jury, it is stated, "found

the prisoner guilty by a plurality of voices, and he heard the verdict and sentence with utter indifference.”\*

### XVII. *Kerr.*

This murderer was executed in Greenock for killing his wife, by beating her to death. One of the witnesses, on the trial, deposed, that “he looked in at the window, and saw Kerr’s wife lying on the floor, and Kerr standing over her with a stick in his hand beating her.”† The poor woman was at that time already dead. The cranium of this criminal being an injected arterial preparation, I could not, without spoiling it, obtain, according to the usual method, its capacity.

### XVIII. *Divan.*

This murderer was executed in Glasgow for cutting his wife’s throat. On the morning of the murder, pretending that he wished to shave himself, he made the unfortunate woman borrow the razor with which he perpetrated the deed. A boy who was one of the witnesses on the trial, stated, that “while he was playing with a ball in the same close in which Divan’s family lived, his ball having run near the prisoner’s house, he went in search of it, and happening to look in at the window, saw Mrs Divan sitting

\* Constable’s Scots Magazine for October 1819, p. 372.

† Report of the Justiciary Trials in the Glasgow Chronicle for 1827.



on a stool, and the prisoner came behind her, and deliberately cut her throat, so as almost to sever her head from her body."\* The murderer, it appeared, then carried the bleeding corpse to the bed, where it was shortly afterwards discovered by her own children; and he deliberately changed his clothes to escape detection.

The most zealous Phrenologists must be constrained to admit, that measurements from the crania of these murderers will constitute a very extensive and complete induction. I shall proceed, therefore, to enquire, whether there be any truth in the assumption, that murderers possess always a large organ of Destructiveness; and shall compare the measurement of this organ in the cranium of each murderer, with the average measurement of the same, in my general Table of adult male crania.

I shall give, first, its *absolute*—secondly, its *relative* size.

The *absolute* size of the organ of Destructiveness, or the distance from Destructiveness to Destructiveness, measures on the skull of

Haggart,	.	5.2	<i>inches</i> ,	which is <i>below</i> the average.
Scott,	. .	5.3	. .	which is <i>below</i> the average.
Anderson,	.	5.2	. .	which is <i>below</i> the average.
Glen,	.	5.4	. .	which is <i>below</i> the average.
Balfour,	.	5.45	. .	which is <i>below</i> the average.
Gordon,	.	5.3	. .	which is <i>below</i> the average.
Cockburn,	.	5.4	. .	which is <i>below</i> the average.

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\* See Report of Justiciary Trials in the Glasgow Chronicle for 1824.

Lingard,	.	4.95	inches,	which is	<i>below</i>	the average.
Pepe,	.	4.8	.	.	which is	<i>below</i> the average.
Macmillan,	.	5.3	.	.	which is	<i>below</i> the average.
Mortimur Collins,	.	5.35	.	.	which is	<i>below</i> the average.
Clydesdale,	.	5.2	.	.	which is	<i>below</i> the average.
M'Kean,	.	5.4	.	.	which is	<i>below</i> the average.
Buchanan,	.	5.3	.	.	which is	<i>below</i> the average.
Kerr,	.	5.5	.	.	which is	<i>below</i> the average.
Divan,	.	5	.	.	which is	<i>below</i> the average.

Not only is the organ of Destructiveness in the crania of these murderers, in its absolute size, below the average of the same organ in the crania collected by Dr Spurzheim, the measurements of which I have included in my general Table, and referred to, as a standard of comparison;—but it is also below the average size of the same organ in the extensive series of crania collected by Sir William Hamilton, which, as I before observed, were principally British specimens.

Phrenologists will in vain attempt to argue, that the measurement of this organ does not give its size; for if it be maintained, as it always hitherto has been, that its size is constituted by a greater or lesser degree of cerebral development, indicated by a corresponding breadth of the cranium, or by a protuberance immediately over each meatus; then the measurement of any series of crania in this direction, cannot fail to give an accurate report of the several comparative sizes of this organ, as its greater or lesser development must always co-exist with a corresponding breadth, or narrowness of the cranium.

I next proceed to give the relative size of this or-

gan, or the proportion which it bears to the rest of the encephalon; and here I may remark, that the method of ascertaining the weight of the encephalon, by filling the cranium with sand, and reducing the specific gravity of the sand to the specific gravity of the brain, has given in this induction a result which corresponds, as nearly as could have been anticipated, with the observations of the Wenzels, who give the weight of the whole brain

At 18 years of age, as	20940	<i>grains.</i>
At 22 . . . . .	21820	do.
At 25 . . . . .	22200	do.
At 31 . . . . .	24120	do.
At 46 . . . . .	20490	do.*

The average weight of the encephala of fifteen criminals, executed at various ages, but generally nearer to the latter period of life, is given in my table of murderers at 20605 *grains*.

The relative size of the organ of Destructiveness, or its proportion to the encephalon, compared with the average proportion of the same organ in my general Table of adult male crania, is

In Haggart, . . . . .	as 1 to 4264.807, which is <i>below</i> the average.
In Scott, . . . . .	as 1 to 3546.415, which is <i>above</i> the average.
In Anderson, . . . . .	as 1 to 3943.653, which is <i>below</i> the average.
In Glen, . . . . .	as 1 to 4065.370, which is <i>below</i> the average.
In Balfour, . . . . .	as 1 to 3927.706, which is <i>below</i> the average.
In Gordon, . . . . .	as 1 to 3736.037, which is <i>below</i> the average.

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\* De Penitiori Structura Cerebri. Tab. iii.

In Cockburn, .	as 1 to 3659.259,	which is nearly the same, but rather <i>below</i> the average.
In Lingard, .	as 1 to 3287.676,	which is <i>above</i> the average.
In Pepe, .	as 1 to 4047.708,	which is <i>below</i> the average.
In Macmillan, .	as 1 to 3696.037,	which is nearly the same, but rather <i>below</i> the average.
In Mortimur Collins,	as 1 to 4508.598,	which is <i>below</i> the average.
In Clydesdale, .	as 1 to 4218.076,	which is <i>below</i> the average.
In M'Kean, .	as 1 to 3702.777,	which is <i>below</i> the average.
In Divan, .	as 1 to 4568,	which is <i>below</i> the average.

Accordingly, of the fifteen crania in which the weight of the encephalon could be ascertained, thirteen possess the organ of Destructiveness, even in proportion to the general size of the brain, *below* the average.

The murderers to whose crania I now refer, were most abandoned and atrocious characters; and the outrages for which they severally were convicted, are among the most frightful that have been recorded in the annals of crime. The murders, in particular, committed by Anderson, Glen, Gordon, and Buchanan, were unprovoked by any aggression on the part of their unhappy victims, and prompted only by that infernal spirit of cruelty, which triumphs in the infliction of pain, and heeds not how many human lives are sacrificed in its appalling career.

In the case of Clydesdale, it is a notorious fact, that after beating to death, without any apparent motive, an inoffensive old man, he returned home, and with fiendish exultation swore, tossing up a halfpenny at the same time, that as the coin "came down either a head or tail," he would murder either his own wife

or the cat that was in the room. The latter happened to return, and the wretch seized the poor animal immediately; and, as I have before stated, having dashed it against the floor, placed it on the blazing fire. The case of the pirate Pepe is also remarkable. One witness states, that, during the scene of carnage on board the Crawford, he saw Pepe standing against the forecastle of the vessel with a knife in his hand. As he approached him, Pepe assumed the attitude of striking, and on turning to avoid the blow, he received a stab in the shoulder. Hastening across the deck, he perceived a man, whom he supposed to be the captain, leaning against the side, and moaning piteously. As he recognised him, the sufferer enquired if they could get nothing to defend themselves with. Witness seized a handspike, which was taken possession of by Potter; and as he was going aloft, the blood of his fellow-sufferers descended in a shower on his head, and inspired him with such horror that he was incapable of advancing. This terrific scene took place a little after midnight, on a bright starlight night. When day at length began to dawn, the same witness saw Pepe, and Courro, another of the pirates, come on board with two muskets, which they loaded in his sight. He then saw them advance from the forecastle, and call up some one from below, whom he recognised to be Aza Bicknell, one of the unfortunate passengers. This poor fellow seemed wounded and writhing with agony: a bandage surrounded his body. He was then either ordered to throw, or threw himself overboard; and, in the act of falling,

was shot at by Courro, whether with or without effect he could not tell ; but when in the water, Pepe discharged his piece at him, and from the shriek that followed as the poor fellow sank, he supposed it took effect. Another witness states, that he saw Pepe leaning over a man who had fallen, and having exclaimed, "*Ah! not yet dead!*" beat the body in a brutal manner, and threw it overboard. After the bloody tragedy was completed, it is stated in the report, that they strided across the deck, exulting in their victory, and resembling demons rather than men. Each contended for the honour of having perpetrated the greatest number of murders. It is further added, that Pepe confessed the first murder he committed was on a fellow-classmate at school, when he was only *fourteen* years of age, and he could not recollect how many he had since perpetrated.

The secretary of the Phrenological Society at Washington transmitted to this country the report whence these particulars have been extracted, and, at the same time, the measurement of the skull. I am under the necessity of stating, that the latter is very inaccurate. I do not pretend to know what sort of callipers are used in America, or whether the elsewhere immutable principles of mathematical science may there bow down before the genius of Phrenological superstition ; but of this I am satisfied, that the organ of Destructiveness has here been represented more than half an inch larger than it actually measures. The dimension of it, as given in the Phrenological Journal, is *5.4 inches*, which, be it observed, is

at any rate *below* the average ; but the correct measurement is only 4.8 ; and I defy any person, using the callipers honestly, to make so considerable a difference. My attention was directed to this skull by Sir William Hamilton, who first noticed that its remarkable narrowness from Destructiveness to Destructiveness constitutes its characteristic peculiarity ; and he informs me, that among the number of crania he has examined, he has never met with one so narrow in this dimension. Here, therefore, is the skull of a cold-blooded and execrable murderer, not only failing to possess a large organ of Destructiveness, but possessing it, according to *any* standard, absolutely and relatively below the average. So triumphant a case is this against the Phrenological *hypothesis*, that I venture, with confidence, to challenge the Phrenologists to produce any cranium of the same size, that measures so narrow from Destructiveness to Destructiveness, as does the skull of this atrocious and bloody murderer.

In my Table of murderers, and in the Table of adult male crania, I have also given measurements of the organs of Secretiveness, Acquisitiveness, and Combativeness, the manifestations attributed to which very frequently form characteristic features of murderers. M'Kean, for example, was at an early period of life addicted to thieving ;—his organ of Acquisitiveness is *below* the average. Haggart was by “habit and repute” a thief ;—his Acquisitiveness is *below* the average. Scott, Mortimur Collins, and Haggart, were notoriously quarrelsome, and of dispositions given

to Combativeness;—each possesses the organ of Combativeness *below* the average.

I now proceed to consider the second condition which is supposed by [Phrenologists to characterise the crania of murderers—*viz.* the deficiency of the alleged organs of the moral sentiments.

I propose estimating the development of these by measuring, as the Phrenologists direct, the organ of Benevolence, and that of Conscientiousness, from the meatus. This measurement gives the distance of the expansion, or the length of the development, which is the first and principal condition of the size of every Phrenological organ. The breadth or periphery of each is, on the other hand, capable of no demonstration, inasmuch as the circumscribed boundaries of each organ are purely ideal, and the exact limits ascribed to each depend, in every instance, on the fancy of the manipulator. The absolute size of the organ of Benevolence, estimated by measuring from the meatus to its centre, is in

The murderer Haggart,	5.15	<i>inches</i> ,	which is <i>above</i> the average.
. . . Anderson,	5.05	. . .	which is nearly the <i>same</i> as the average.
. . . Glen,	5.05	. . .	which is nearly the <i>same</i> as the average.
. . . Balfour,	5.2	. . .	which is <i>above</i> the average.
. . . Cockburn,	5.2	. . .	which is <i>above</i> the average.
. . . Macmillan,	5.2	. . .	which is <i>above</i> the average.
. . . Collins,	5.25	. . .	which is <i>above</i> the average.
. . . Clydesdale,	5.2	. . .	which is <i>above</i> the average.
. . . M'Kean,	5.1	. . .	which is <i>above</i> the average.
. . . Buchanan,	5.1	. . .	which is <i>above</i> the average.



The murderer Kerr, 5.4 inches, which is *above* the average.  
 . . . Divan, 5.2 . . . which is *above* the average.

Four only of the seventeen murderers possess the organ of Benevolence in its absolute size *below* the standard of comparison ; and in these exceptions, the general capacity of each cranium, it should be observed, is remarkably small.

The organ of Benevolence, even in proportion to the size of the encephalon, is in the murderer Scott *above* the average ; Anderson, *above* the average ; Gordon, who murdered the pedlar boy, *above* the average ; also in Cockburn, *above* the average ; in Lingard, *above* the average ; in the atrocious Pepe, *above* the average ; in Macmillan, *above* the average ; in M'Kean, *above* the average.

Here it may be observed, that the anti-Phrenological evidence, in these cases, does not rest on the circumstance of these murderers possessing an organ of Benevolence, because every individual is supposed to have all the organs ; but it rests on the incontrovertible fact of their possessing it, both in absolute and relative size, *above* the ordinary standard. A large development of Benevolence, on the skulls of such atrocious monsters as Pepe, Gordon, Scott, &c. is as irreconcilable with their characters, as the profession of the most heavenly virtue is opposed to the perpetration of the most damning iniquities.

The organ of Conscientiousness next claims consideration ; and in its absolute size, estimated by measurement from the meatus to its centre, is

In Haggart, . . .	4.4 inches,	which is nearly the <i>same</i> as the average.
In Anderson, . . .	4.5 . . .	which is <i>above</i> the average.
In Gordon, . . .	4.4 . . .	which is nearly the <i>same</i> as the average.
In Macmillan, . . .	4.6 . . .	which is <i>above</i> the average.
In Mortinur Collins,	4.6 . . .	which is <i>above</i> the average.
In Clydesdale, . . .	4.75 . . .	which is <i>above</i> the average.
In M'Kean, . . .	4.4 . . .	which is nearly the <i>same</i> as the average.
In Buchanan, . . .	4.4 . . .	which is nearly the <i>same</i> as the average.
In Kerr, . . . .	4.9 . . .	which is <i>above</i> the average.
In Divan, . . . .	4.5 . . .	which is <i>above</i> the average.

Anderson, Gordon, Lingard, Macmillan, and M'Kean, possess the organ of Conscientiousness, even in proportion to encephalon, *above* the average.

Lastly, I proceed to consider the third condition which is presumed to characterise the crania of murderers—*viz.* the alleged deficiency of the anterior cerebral development. This may fairly be judged of by two measurements; *first*, the distance from the meatus to Lower Individuality, which the Phrenologists themselves commonly take; *second*, the distance from the meatus to Causality, which, being situated higher in the forehead, gives a better idea of the comparative proportion of the anterior development.

The quantity of brain before the ear, estimated by its length, and judged of by these dimensions, is

In Haggart, *above* the average.

In Glen, *above* the average.

- In Balfour, *above* the average.
- In Gordon, *above* the average.
- In Cockburn, *above* the average.
- In Pepe, *above* the average.
- In Macmillan, *above* the average.
- In Mortimur Collins, *above* the average.
- In M'Kean, *above* the average.
- In Buchanan, *above* the average.
- In Kerr, *above* the average.

The anterior development in the skull of Burke is also fully proportioned to the general size of the skull. I have, on this subject, satisfied myself by a still more conclusive method of estimating the comparative quantities of brain before the ear. I have measured from meatus to meatus, with a piece of string, passing it through the centre of the organs of Comparison and Causality, and found decidedly, that the crania of murderers exhibit no remarkable deficiency of brain before the ear, or preponderance of development in the region to which the animal propensities are referred.

In further confirmation of the several positions I have maintained, I proceed to give the measurements of the cranium of the late celebrated Dr David Gregory, who was Professor of Mathematics in the University of Edinburgh, and subsequently appointed Savilian Professor of Astronomy in Oxford. He was the distinguished friend and companion of Sir Isaac Newton; he was the learned author of several valuable works on mathematical science; and a man of high moral and intellectual virtue. He died on his way

from Oxford to London, in Berkshire; and the skull is authenticated by the circumstance of its having been taken from the place of interment by a gentleman, who transmitted it to a distinguished individual in this city, who has it still in his possession.

The capacity of this cranium, or the weight of its encephalon, is 21776 *grains*.

From Destructiveness to Destructiveness, is 5.7 *inches*; and its proportion to the encephalon as 1 to 3820.350.

The organ of Destructiveness in the learned Professor is, in its *absolute* size, larger than the same organ in every murderer included in my induction; and, even in proportion to the general size of the brain, larger than the same in Burke, Haggart, Anderson, Glen, Balfour, Pepe, Mortimur Collins, Clydesdale, and Divan.

The organ of Combativeness in the Professor measures 5.6 *inches*, which is larger than the same organ in every murderer.

His organ of Acquisitiveness is 4.95 *inches*; Balfour has it the same; and every other murderer has it *less*, including even the thieves Gordon, M'Kean, and Haggart.

His organ of Secretiveness is 5.7 *inches*, which is larger than the same in each of the murderers.

Let us now look to the organs of the moral sentiments;—the organ of Benevolence, on the cranium of Dr David Gregory, measures 5.1 *inches*—its proportion to the encephalon is as 1 to 4269.803.

Burke has this organ in its absolute size, the *same*

as the celebrated Professor. Glen and Anderson have it *nearly the same*. M'Kean and Buchanan have it the *same*. Balfour, Cockburn, Macmillan, Mortimur Collins, Clydesdale, Kerr, and Divan, all atrocious miscreants, have it *larger*.

Even in proportion to the size of the encephalon, Burke, Scott, Anderson, Balfour, Gordon, Cockburn, Lingard, Pepe, Macmillan, Clydesdale, and M'Kean, have each a *larger* organ of Benevolence than the learned and virtuous Professor.

The organ of Conscientiousness, on the skull of Dr David Gregory, measures *4.7 inches*. Its proportion to the encephalon is as 1 to 4633.191.

Clydesdale and Kerr have this organ in its absolute size *larger*; and in proportion to the encephalon, Burke, Anderson, Gordon, Lingard, Pepe, Mortimur Collins, Clydesdale, and M'Kean, have each the organ of Conscientiousness *larger* than the Professor.

Let us now proceed to the intellectual organs, remembering, at the same time, the justly distinguished character of Dr David Gregory.

The distance from the meatus to Comparison, measures, on his cranium, *5 inches*; the same organ is,

In Haggart,	4.9 inches,	<i>nearly the same</i>	as the Professor's.
In Anderson,	4.9 . . .	<i>nearly the same</i> .	
In Glen,	. . . 5 . . .	<i>the same</i> .	
In Pepe,	. . . 5 . . .	<i>the same</i> .	
In Balfour,	. . . 5 . . .	<i>the same</i> .	
In Macmillan,	4.9 . . .	<i>nearly the same</i> .	
In Collins,	. . . 5.2 . . .	<i>larger</i> .	

- In M'Kean, . 5 . . . the *same*.  
 In Buchanan, 5.1 . . . *larger* than the Professor's.  
 In Kerr, . . 5.2 . . . *larger*.

The organ of Causality, to which the power of tracing the relations of cause and effect, and of reasoning closely, is referred, measures, in Dr David Gregory, from the meatus to the Causality on the *opposite* side of the skull, 5.1 *inches*.

By taking this measurement, an accurate report is also given of the general anterior cerebral development.

The organ of Causality, or quantity of brain before the ear, thus estimated, measures,

In Haggart,	. . .	5.25 <i>inches</i> ,	which is <i>larger</i> than the Professor's.
In Scott,	. . .	5.2 . . .	which is also <i>larger</i> .
In Anderson,	. . .	5.3 . . .	which is also <i>larger</i> .
In Glen,	. . .	5.35 . . .	which is also <i>larger</i> .
In Balfour,	. . .	5.4 . . .	which is also <i>larger</i> .
In Macmillan,	. . .	5.2 . . .	which is also <i>larger</i> .
In Mortimur Collins,	. . .	5.5 . . .	which is also <i>larger</i> .
In Clydesdale,	. . .	5.3 . . .	which is also <i>larger</i> .
In M'Kean,	. . .	5.4 . . .	which is also <i>larger</i> .
In Buchanan,	. . .	5.3 . . .	which is also <i>larger</i> .
In Kerr,	. . .	5.7 . . .	which is also <i>larger</i> .

Hence these criminals prove to have had each a greater quantity of brain before the ear, than the distinguished Professor of Astronomy.

From the meatus to the occipital spine, which may be taken as a criterion of the posterior cerebral development; or the quantity of brain behind the ear,

to which region the animal propensities are ascribed, measures on the cranium of Dr David Gregory 4.35.

On the skull of Haggart,	4.05 inches,	which is less than the Professor's.
. . . Scott,	4.05 . . .	which is less.
. . . Glen,	4.3 . . .	which is less.
. . . Anderson,	4.05 . . .	which is less.
. . . Pepe,	3.6 . . .	which is less.
. . . Balfour,	3.7 . . .	which is less.
. . . Gordon,	3.5 . . .	which is less.
. . . Lingard,	3.75 . . .	which is less.
. . . Mackmillan,	3.8 . . .	which is less.
. . . Mortimur Collins,	3.8 . . .	which is less.
. . . Clydesdale,	3.7 . . .	which is less.
. . . M'Kean,	3.7 . . .	which is less.
. . . Buchanan,	3.5 . . .	which is less.
. . . Kerr,	4 . . .	which is less.
. . . Divan,	3.9 . . .	which is less.

Hence, in direct opposition to the Phrenological assumption, the philosopher proves to have the larger posterior development; and the murderers to have the organs of the animal propensities consequently *less* than the individual of high moral and intellectual attainment.

The counter Phrenological propositions deduced from the present induction, are,

*First*, The most atrocious murderers not only fail to possess a large endowment of the alleged organ of Destructiveness, but have it, very frequently, both *absolutely* and *relatively* below the average size.

*Second*, The most cruel and horrid murderers fre-

quently possess a high development of the pretended organs of the moral sentiments, particularly those of Benevolence and Conscientiousness.

*Third*, Murderers do not possess a less development of the supposed intellectual organs, nor a greater development of those to which the animal propensities are referred, than individuals of high intellectual and moral character.

Here I may observe, that the first ten murderers in my Table constitute a part of Sir William Hamilton's induction, he having, in addition to his general Table of European male crania and the males of Spurzheim, allowed me to take extracts of measurements from his Table of executed murderers.

For the use of the other crania, the measurements of which I have presented in my Table, I am indebted to Dr Jeffray, the learned professor of Anatomy in the University of Glasgow. I am also obliged to the Royal Physical Society of Edinburgh, for the use of the skull of Lingard, who was executed in Derbyshire.

Sir William Hamilton, I may add, after instituting a fair enquiry into this subject some months ago, came to conclusions similar to those which I have above stated. Taking the skulls of *all* the murderers preserved in the different musea of this University, amounting to above a dozen, as constituting at once a *large* and an *unselected* series, he had ascertained that, whether compared with any general average, or with the heads of individuals remarkable for their moral and intel-



lectual virtues, there was nothing to warrant the doctrine of the Phrenologists, that such criminals are distinguished from other persons by any excess of the pretended organs of Destructiveness, and of those of the animal propensities in general, or by any deficiency in those dimensions which express the Phrenological development of the intellectual and moral powers ; and on this induction he has established one of the propositions in his forthcoming work, "*The Fictions of Phrenology, and the Facts of Nature.*"

#### IV.

*Do the most notorious thieves possess the organ of Acquisitiveness larger, or that of Conscientiousness smaller, than Individuals of exemplary character?*

To determine this question, I shall briefly state to the Society, that I have taken measurements of the organs of Acquisitiveness and Conscientiousness, and at the same time, the general size of the head, in an unselected class of individuals, English, Scotch, and Irish, and compared these with similar measurements from the heads of all the most notorious thieves in the Edinburgh Jail and Bridewell.

The number of these convicted thieves proved to be 22 ; and of these, 20 are Scotchmen. The average absolute size of the organ of Acquisitiveness in them, is 5.525. The average absolute size of their organ of Conscientiousness, 4.806 *inches*.

On referring to my Table of Englishmen, (28 in

number,) 14 have the organ of Acquisitiveness, in its absolute size, *above* the average; and 12 that of Conscientiousness *below* the average of these organs, in the 22 thieves.

On referring to my Table of Scotchmen, (25 in number,) 16 have the organ of Acquisitiveness, in its absolute size, *above*; and 11 that of Conscientiousness *below* the average of the same, in the thieves.

On referring to the Table of Irishmen, (27 in number,) 14 have the organ of Acquisitiveness, in its absolute size, *above*; and 16 that of Conscientiousness *below* the average of the same organs in the thieves.

Accordingly, of the 80 respectable individuals taken without any selection, 44 have the organ of Acquisitiveness, in its absolute size, *above* the average; and 39 that of Conscientiousness, in its absolute size, *below* the average of the same organs in the above unselected number of notorious and convicted thieves.

Our inability to ascertain accurately its depth, cannot fail to oppose an almost insuperable difficulty to every attempt, to determine accurately the size of the living head. The method to which hatters have recourse, and which gives only its average length and breadth, is, I am aware, in many respects very imperfect, yet the only one of which even Phrenologists can avail themselves. In the case of Hare, I have given the proportions of the several organs to these dimensions, and shall, in the present comparison; adopt the same plan. I shall not, therefore, here enter into any discussion on the general doctrine of proportions. Many will, I am satisfied, consider it

sufficient to prove, that from a large class of individuals taken without any selection, the average *absolute* size of an alleged organ, is found not to co-exist with the disposition it is supposed to characterise.

Desirous, however, of rendering my induction as complete as possible, I have given not only the *absolute*, but also the *relative*, sizes of the several organs, or their proportions to the dimensions of the head, as far as during life the latter can be determined.

The average relative size of the organ of Acquisitiveness, or its average proportion to the size of the head, in the 22 thieves, is as 1 to 2.421 ; that of Conscientiousness, as 1 to 2.787.

On referring to the Tables, it will be seen, that of the 28 Englishmen, 11 possess the organ of Acquisitiveness *above*, 16 that of Conscientiousness, in proportion to the size of the head, *below*, the average of the same in the 22 thieves.

Of the 25 Scotchmen, 13 have the organ of Acquisitiveness *above*, 16 that of Conscientiousness, in proportion to the size of the head, *below* the average of the same organs in the thieves.

Of the 27 Irishmen, 7 have the organ of Acquisitiveness *above*, and no fewer than 22 that of Conscientiousness, even in proportion to the size of the head, *below*, the average of the same in the thieves.

The counter Phrenological proposition deduced from this induction, is,

The organ of Acquisitiveness is often absolutely and relatively *less*, and that of Conscientiousness absolutely and relatively *larger*, in the most no-

torious thieves, than in individuals of exemplary character.

The only comment I should conceive it necessary to make on these deductions, is sufficiently expressed by Mr Combe, who, in speaking of the truth or falsehood of Phrenology, remarks: "If two individuals were found to possess a larger development of Acquisitiveness; but if in the one Conscientiousness was very large, and in the other very small, and we were told that the one was a thief, and the other an honest man, how complete would the refutation be, if the one possessing the larger Conscientiousness were found to be the rogue."\*

The facts that constitute the present induction were, I may repeat, taken without selection;—in living individuals, I took the measurements of the first who presented themselves, and with the several crania adopted the same plan; nor have I in a single instance rejected the measurement of a person or cranium, because it did not appear to accord with anti-Phrenological evidence. I have always supposed, and am confirmed in the opinion, that practical Phrenology is dependent entirely on accidental contingencies; and when it is considered that we are referred to thirty-five cranial prominences, which are the common conditions of every head, and to as many faculties which are the common attributes of every mind, it may easily be understood, why the alleged characteristic configurations will *occasionally* correspond with the manifestations attributed to them, and why

\* Phrenological Transactions, p. 323.

as frequently a diametrically opposite relation will be found to exist.\*

It remains for me only to state, that I have taken every care to ensure the accuracy of my measurements, which have always been taken in the presence of impartial persons, many of whom will testify, that so completely has this investigation been conducted on experimental principles, that I did not, and could not, until the whole had been concluded, anticipate the result of my induction. Among other gentlemen, I have in particular to thank Mr Deseret, who is a professed Phrenologist, and a member of the Phrenological Society of Edinburgh, for having occasionally superintended my measurements. Also Mr Holroyd, my fellow-President in this Institution, who has very frequently acted as an impartial umpire on such occasions.

These gentlemen will, I believe, bear testimony to the general accuracy of my measurements; † and should

\* The whole doctrine of Phrenological chances is ably stated by Dr Milligan, in the *Appendix* to his translation of Majendie's *Physiology*.

† The communications I have received on this subject, I think it proper, with the consent of the writers, to subjoin.

“ MY DEAR SIR,

“ I have much pleasure in authorizing you to state, that *those* measurements which I have seen you take, have always appeared to me to have been taken accurately. I re-measured, as you are aware, the heads of a number of thieves in the Edinburgh Jail and Bridewell, which you had previously taken, and found that your measurements so far corresponded with mine, that I can have no hesitation in acknowledging my reliance on the ge-

any person, resuming the same experiments, find any difference in his measurement and my report, the variation is to be attributed rather to the inadequate means which Phrenologists have given us of ascertaining any definite knowledge of their *soi-disant Science*, than to any desire on my part either to “extenuate aught, or set down aught in malice.”

Formerly it was maintained, that the production of a single anti-Phrenological fact would be sufficient to overturn the whole theory; but I am satisfied that, if Phrenologists would only, as Dr Spurzheim terms it, “*go into nature* ;”—if they would have recourse to an *unselected* series of measurements, or manipulations, they would at once discover that their system is no more than the “baseless fabric of a vision,” and as false as any other superstition that

neral correctness of your measurements, although, as a Phrenologist, *I do not agree with your deductions, for reasons which, within the limits of a note, I cannot state.*

“It is also due to you to state, that I regret, from the nature of my professional engagements, I have not been able to witness *all* your measurements, which you have *frequently* invited me to superintend. I remain, yours truly,

“*Edin. April 17, 1829.*”

PHINEAS DESERET.

“DEAR SIR,

“I have much pleasure in stating, that during the time I attended the measurements which you have taken, I can vouch for their correctness, whatever may be the deduction that may be drawn from your investigation. Some of your measurements I myself repeated, and found them correspond with your report. I am, truly yours,

“A. T. HOLROYD.

“*Edinburgh, April 16, 1829.*”

has ever been imposed on the ignorance and credulity of mankind.

The Public is aware of the fair pretensions which the Phrenologists have invariably held forth; yet, what has been the line of policy they have adopted? They have pretended to establish a system of philosophy founded exclusively on facts, and yet have never had recourse to any fair, or candid *experimentum crucis* by which the truth or falsehood of their primary propositions might be determined;—they have adduced only *ex parte* evidence, and this, on their own showing, is of the most unsatisfactory kind, inasmuch as they have never established any standard by which the proportions of the alleged organs can be determined;—they have termed their organs, “*moderate*,” “*full*,” “*large*,” “*rather large*,” &c., and these terms, to the present day, have been used, without any rule or definite principle by which the application of them can be regulated;—they, with an inconsistency, and yet a gravity, worthy of Hudibras in his metaphysical disquisitions, persist in seriously maintaining a science of *proportions* without a *scale of measurement*;—they wander over the country, preaching their doctrines *ex cathedra*, as though they had really a foundation in truth; whilst it is a notorious fact, of which they themselves must be aware, that there is not an eminent man of science in Europe who has become a convert to them;—they profess to maintain, at all times, the principles of free and manly discussion; and for this purpose have founded a society in this city, for the admission of believers, and do not allow

any stranger, who may visit it, to express an opinion;—they profess that their doctrines are as well established, and as palpable to every enquirer, as the most demonstrable truths in nature, yet do not agree among themselves on the most preliminary points;—Dr Gall ridiculed the bumps of Dr Spurzheim, Dr Spurzheim rejects, with disdain, the callipers of Mr Combe; and Mr Combe has been lately engaged in an open Phrenological warfare with one of the most intelligent of his contemporaries, on the subject of what is even the necessary result or tendency of their faith;\*—they give an organ one function to-day, another to-morrow;—they maintain that a large organ of Veneration is, at one time, the characteristic configuration of the head of a saint—at another, equally essential to that of the most notorious and professed infidel!† Lastly, come the interminable combinations of their imaginary organs; and thus the Phrenologists shift from argument to argument, from position to position, resembling the ghosts in Virgil's *Inferno*:

Huc illuc volitant, nec certa in sede morantur.

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\* See the controversy between Messrs Combe and Scott.

† See the report of the development of *Voltaire*, *Phrenological Journal*, vol. iii. p. 571.